

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A23G 3/28, C09D 11/00, A23G 3/20	AI	(11) International Publication Number: WO 97/27759 (43) International Publication Date: 7 August 1997 (07.08.97)
---	----	--

(21) International Application Number: PCT/GB96/00229

(22) International Filing Date: 2 February 1996 (02.02.96)

(71) Applicant (for all designated States except US): CADEX LIMITED [GB/GB]; Anchor Brewhouse, 50 Shad Thames, Tower Bridge City, Tower Bridge, London SE1 2YB (GB).

(72) Inventor; and

(75) Inventor/Applicant (for US only): YOUNG, Robert, J. [GB/GB]; 20 Brook Street, Hastings, East Sussex TN34 1RX (GB).

(74) Agent: LYND, Michael, Arthur, Edward Evans & Co., Chancery House, 53-64 Chancery Lane, London WC2A 1SD (GB).

(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

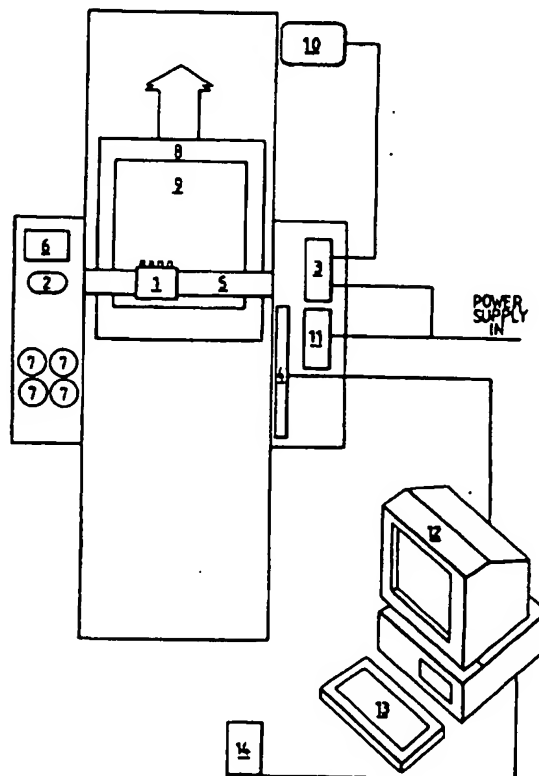
Published

With international search report.

(54) Title: A MACHINE AND METHOD FOR PRINTING ON SURFACES OF EDIBLE SUBSTRATES

(57) Abstract

A machine adapted to print an image as hereinbefore defined onto a surface of an edible substrate, the machine including a bubble-jet printer head assembly (1), and including containment means (7) for containing a liquid food colourant, a surface (8) for supporting the said edible substrate (9), said surface and said head assembly being movable relative to each other, and control means (10, 12, 13) for controlling the said head assembly with printing instructions and for causing said relative movement in accordance with the desired image to be printed upon an edible substrate. This invention also includes a method of printing an image onto an edible substrate.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

A MACHINE AND METHOD FOR PRINTING ON SURFACES OF EDIBLE SUBSTRATES**FIELD OF THE INVENTION**

This invention relates generally to a machine and to a method for printing on an edible substrate. In particular it relates to a machine and a method for printing on an edible substrate using bubble-jet technology to produce a polychromatic or monochromatic image on an edible substrate by the use of a food dye or edible ink.

RELATED BACKGROUND ART

Decorated cakes are well known and have been decorated by hand for many many years. Various methods are currently in use, e.g. Hand painting of the design, spraying food colouring through a stencil, cutting out shapes from soft icing or marzipan, piping designs with molten chocolate, decorative designs with a piping bag of soft icing, applying plastic or other types of novelty directly to the cake top, silk screening of images onto plaques of sugar or wafer fixed to the cake top or sides, etc. Most celebration cakes are decorated by hand and rely on the skill and dexterity of the operative to achieve quality results. These types of decorated cakes are however expensive and time consuming to produce because of the skilled labour involved and it is not possible with the materials and equipment currently available to produce a commercially viable product by hand with very fine detail together with a multiplicity of colours or fine shading.

DEFINITION OF AN IMAGE.

The term "image" as used throughout the specification and claims refers to any polychromatic or monochromatic design, picture, text or pattern which is required to be reproduced by the invention.

SUMMARY OF THE INVENTION

It is an object of the present invention to alleviate the problems and difficulties of known methods and apparatus for the decoration of cakes, etc.

According to a first aspect of the present invention there is provided a machine adapted to print an image as hereinbefore defined onto a surface of an edible substrate, the machine including a bubble-jet printer head assembly, and including containment means for containing a liquid food colourant, a surface for supporting the said edible substrate, said surface and said head assembly being movable relative to each other, and control means for controlling the said head assembly and for causing said relative movement in accordance with the desired image to be printed upon a edible substrate.

According to a second aspect of the present invention there is provided a method of printing an image on a surface of an edible substrate which method comprises arranging for relative movement between said surface and a bubble-jet printer head assembly and controlling said print head assembly to cause a liquid food colourant to be printed upon the substrate in accordance with the desired image.

Preferably the bubble-jet printer head assembly is of the type produced by Canon Inc under European Patent Number EP 0 348 181 A2.

In a preferred method and machine of this invention, the printer head comprises a discharge opening for liquid discharge and an electricity-heat converter. The electricity-heat converter has a region formed by oxidation of at least part of an electro-conductive material, and the region is adapted to generate heat.

Preferably the machine of the present invention includes a computer system to store and manipulate the image. Preferably the machine of the present invention includes within such a computer system encryption means which can only be accessed by a purchaser if they first obtain from the supplier the decryption code to unscramble the image. This feature enables copyrighted images to be offered to the purchaser whilst still being able to guarantee the copyright holder his rightful royalties based on the number of times the purchaser utilises the image.

Preferably the machine of the present invention is capable of printing on both regular and irregular substrates. Furthermore it is preferred that the machine be adapted to print on surfaces having a degree of three dimensionality.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

An embodiment of a machine according to the present invention will now be described, by way of example only, by reference to the accompanying drawings in which;

Figure 1 is a diagrammatic representation of an embodiment of a machine according to the present invention;

Figure 2 is a diagrammatic representation of a method of obtaining polychromatic output from the machine of Figure 1; and

Figure 3 is an example of the output of the machine of Figure 1 showing detail that would not otherwise be possible by any other method.

Referring to Figure 1 of the drawings there is shown a bubble-jet head assembly (1) together with a stepping motor (2) for moving the head assembly (1). The stepping motor (2) is connected to a power supply (11). A logic board (4) controls the movement of the bubble-jet head assembly (1) via the stepping motor (2) across a carriageway (5). A pump (6) is provided to clean the bubble-jet head assembly (1) and deliver the liquid food colour to the bubble-jet head assembly (1) from ink reservoirs (7). A movable surface

(8) is provided to support an edible medium (9); a stepping motor (10) is connected to a dedicated power supply (3) and to a logic board (4) to advance the movable surface (8). The required image is stored on magnetic media held within a computer (12) and is accessed by entering the required image code via a keyboard, keypad or pointing device (13). If the image is copyrighted it will be protected by an encryption algorithm and may only be decrypted by means of a card reader (14). The image once selected is sent to the bubble-jet head assembly (1) via the logic board (4) e.g. as a bitmap, raster image, postscript or pcx file etc., which will cause the bubble-jet head assembly (1) to move across the carriageway (5) by use of the stepping motor (2) and will then deposit colourant taken from the reservoirs (7) at predetermined positions across the top of the edible medium. As the bubble-jet print head assembly (1) reaches the end of the carriageway (5) the stepping motor (10) will advance the edible medium (9) by moving the movable surface (8) a predetermined distance, e.g. 1/4 inch. The bubble-jet head assembly (1) will then print in the opposite direction along the carriageway (5) until it reaches its starting position. The machine will continue the above operations until the required picture, pattern or text has been completed. By this method virtually unskilled operatives can produce decorated cakes or cake tops to a high resolution and a multiplicity of colours e.g. 360 x 360 dots per square inch and 16.7 million colours.

In a preferred embodiment four reservoirs are provided housed in a compartment within the casing, each containing a food colourant of a different colour. The food colourant

can of course be black, white, or any other colour. in the preferred embodiment however the four reservoirs contain Yellow, Magenta, Cyan and Black respectively. Each reservoir supplies a separate and distinct printing head; by this means it is possible to print a multiplicity of colours which is not possible with machines having a common reservoir. In general the machine will also include associated elements such as a power supply, a control panel, logic board, and associated wiring. Any suitable means may be provided to operate the machine, e.g. a computer, keypad or pointing device. A movable surface is provided to move the edible medium, e.g. a tray, conveyor belt or rollers. In a preferred embodiment the surface for holding the edible substrate is movable longitudinally of the machine by means of a conveyor belt, chain drive, rollers or similar device and the bubble-jet head assembly is movable laterally of the machine some 2-10 mm above the edible substrate. By these means the bubble-jet head assembly at no time comes into contact with the edible surface, which also means that the machine and method of the present invention can print upon an edible substrate having depth variations of up to, say, 8 mm.

In a preferred embodiment the area of edible surface to be decorated can be from a small dot up to 297 mm x 420 mm (A3) or any other such size as determined from time to time.

The machine of this invention may be used in conjunction with any suitable edible substrate. e.g. Royal icing, gum paste, sugar paste, fresh cream, cover paste, ice cream, butter cream, wafer, rice paper, gelatine, marzipan, fondant, american frosting, meringue, boiled icing, chocolate, boiled sugar, confectioners cream, custard, blancmange, cheesecake filling, pastry, pastillage, nut paste, wafer, biscuit, cheese, potato, pasta, etc.

Referring to figure (2) there is shown a method by which small dots of different colourant may combine to give a plurality of different colours by the following method. The print head (1 Fig 1) moves over the surface of the edible substrate (9 Fig 1) and each head deposits flying droplets of colourant which are discharged towards the edible substrate according to the instructions received from the computer (12 Fig 1). In the preferred embodiment the preferred colours are Yellow, Magenta, Cyan and Black which when combined on the edible substrate in varying proportions enable the production of polychromatic images to be produced and not just monochromatic images as would be produced by machines that have single heads.

Figure (3) shows an example of the output of the machine in figure (1). It will be seen that it is an incredibly intricate picture of three Lions. This is a higher quality image than has previously been obtainable on an edible substrate.

The machine of this invention enables individual designs to be produced to the same or better standard than has hitherto been commercially feasible and at a fraction of the labour and material cost.

The method and machine of the present invention can operate to apply polychromatic as well as monochromatic images effectively onto edible substrates.

It will also be understood that the foregoing structure is capable of variation without departing from the spirit and scope of the present invention.

CLAIMS

1. A machine adapted to print an image as hereinbefore defined onto a surface of an edible substrate, the machine including a bubble-jet printer head assembly, and including containment means for containing a liquid food colourant, a surface for supporting the said edible substrate, said surface and said head assembly being movable relative to each other, and control means for controlling the said head assembly with printing instructions and for causing said relative movement in accordance with the desired image to be printed upon an edible substrate.
2. A machine according to claim 1 which is adapted to print a polychromatic image.
3. A machine according to claim 2 wherein said containment means comprises a plurality of reservoirs for a plurality of liquid food colourants.
4. A machine according to claim 1 wherein the bubble-jet head assembly is of the type comprising a discharging opening for liquid discharge and an electricity-heat converter, the electricity-heat converter having a region formed by oxidation of at least part of an electro-conductive material, and the region being adapted to generate heat.

5. A machine as claimed in any preceding claim wherein the edible substrate is movable longitudinally of the machine and the head is movable laterally of the machine.
6. A machine as claimed in any one of claims 1-4 above wherein the edible substrate is movable laterally of the machine and the head is movable longitudinally of the machine.
7. A machine as claimed in any preceding claim which includes a computer system.
8. A machine as claimed in any preceding claim which is adapted to be operated from a keyboard, keypad or pointing device.
9. A machine as claimed in any preceding claim which is adapted to control the use of any copyrighted images within the system.
10. A machine as claimed in any preceding claim which is adapted to monitor for a copyright holder the number of times a copyright image is printed.
11. A machine as claimed in any preceding claim adapted to re-size any image.

12. A machine as claimed in any preceding claim adapted to change the colour of any image or part thereof.
13. A machine as claimed in any preceding claim in which means are provided to limit the ability to recolour images which are covered by copyright.
14. A machine adapted to print an image (as hereinbefore defined) substantially as hereinbefore described, with reference to figure (1) of the accompanying drawings.
15. A machine according to any one of the preceding claims which includes a scanning device to enable scanning and printing of an image.
16. A method of printing a image on a surface of an edible substrate which method comprises arranging for relative movement between said surface and a bubble-jet printer head assembly and controlling said print head assembly to cause a liquid food colourant to be printed upon the substrate in accordance with the desired image.

1/3

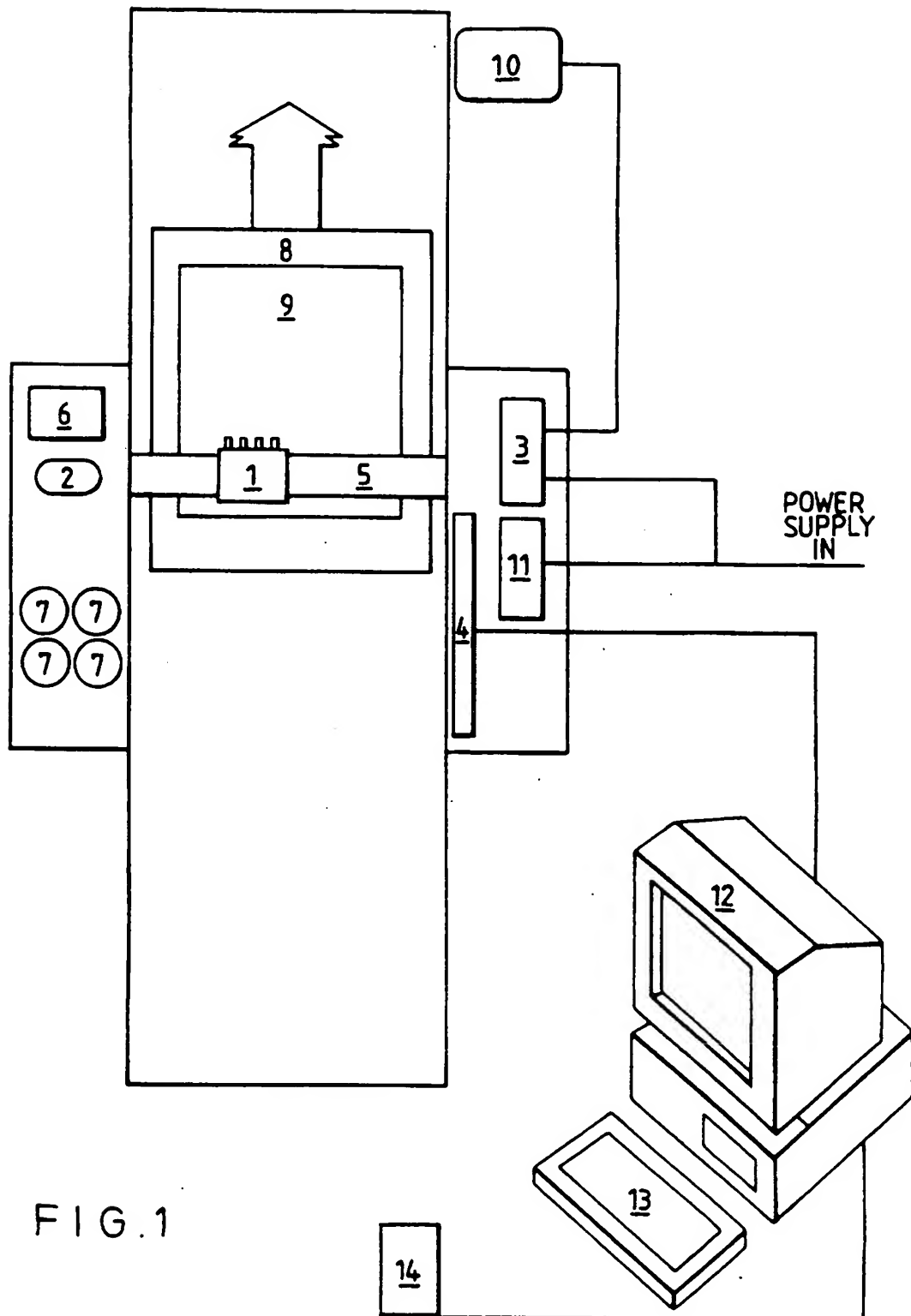
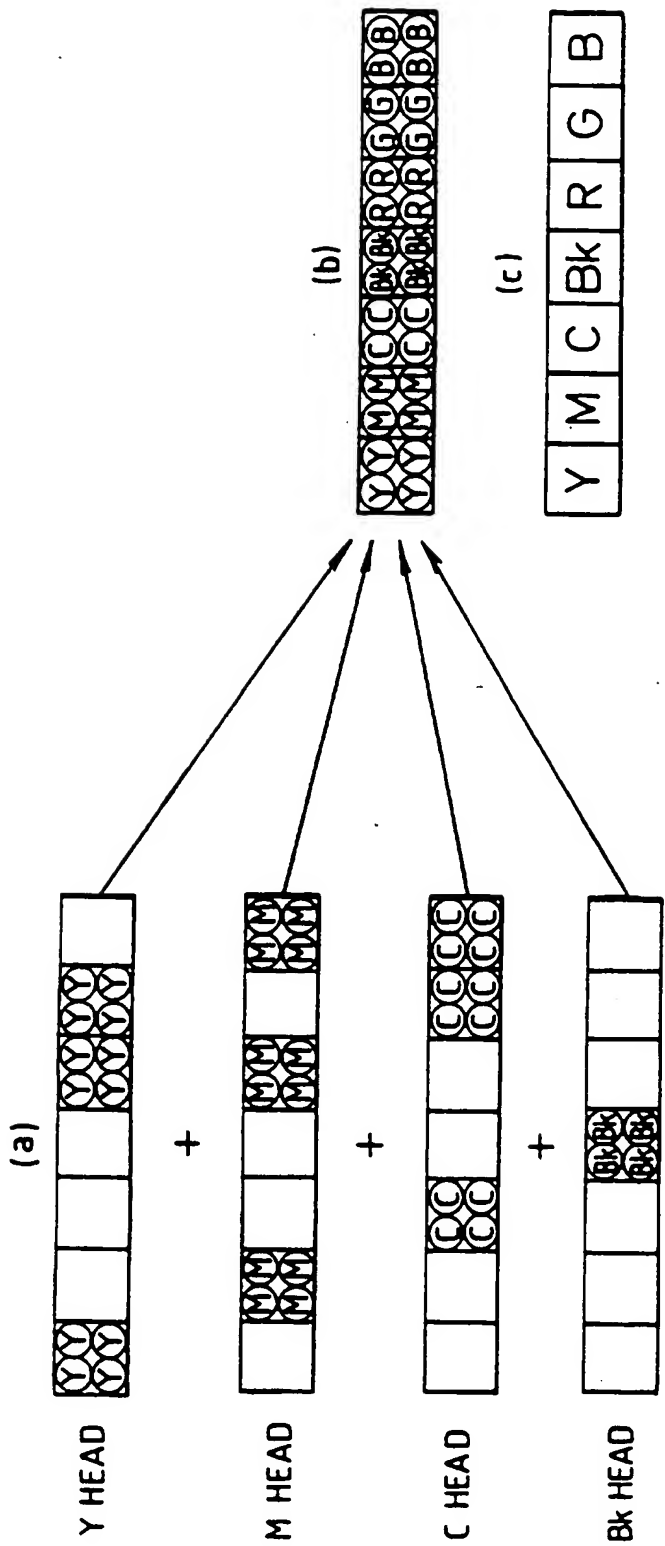


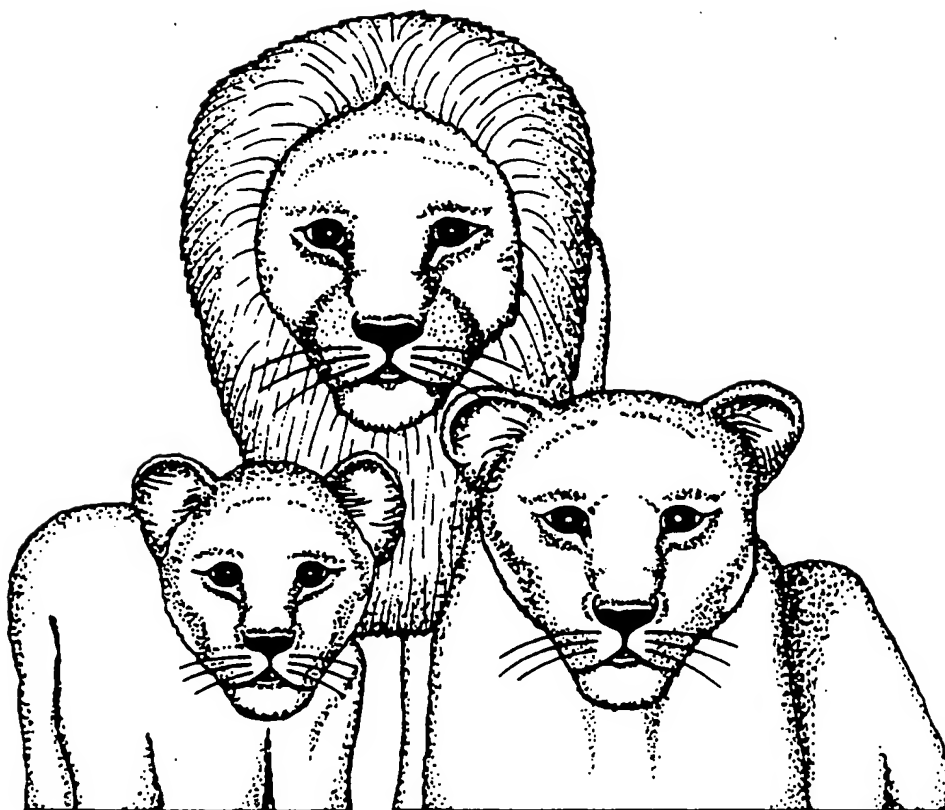
FIG. 1



Y = YELLOW
M = MAGENTA
C = CYAN
Bk = BLACK
R = RED
G = GREEN
B = BLUE

FIG. 2

3/3



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 96/00229

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 A23G3/28 C09D11/00 A23G3/20		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 A23G C09D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 118 351 (CANON) 2 June 1992 See also &EP447870 see column 3, line 53 - column 4, line 47; claims 1,3; figures; example 7 see column 5, line 3-6 see column 12, line 45 - column 13, line 42 see column 14, line 24-29 ---	1-16
A	US,A,5 453 121 (TONEJET) 26 September 1995 ---	
A	US,A,4 585 484 (CANON) 29 April 1986 ---	
A	WO,A,92 14795 (P. LYON) 3 September 1992 ---	
A	US,A,5 453 122 (P. J. LYON) 26 September 1995 --- <div style="text-align: center;">-/--</div>	
<div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex. </div>		
<div style="display: flex;"> <div style="flex: 1;"> <p>* Special categories of cited documents:</p> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="flex: 1;"> <p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>*&* document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search <div style="text-align: center;">2 October 1996</div>		Date of mailing of the international search report <div style="text-align: center;">22.10.96</div>
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016		Authorized officer <div style="text-align: center;">Guyon, R</div>

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 96/00229

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 397 387 (VIDEOJET SYSTEMS) 14 March 1995	
A	WO,A,96 02598 (TONEJET) 1 February 1996	
A	EP,A,0 348 181 (CANON) 27 December 1989 cited in the application	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 96/00229

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5118351	02-06-92	JP-A- 4211470	03-08-92
		AT-T- 117349	15-02-95
		AU-B- 642976	04-11-93
		AU-A- 7265991	12-09-91
		CA-A- 2037220	08-09-91
		CN-A- 1055376	16-10-91
		DE-D- 69106750	02-03-95
		DE-T- 69106750	01-06-95
		EP-A- 0447870	25-09-91
		ES-T- 2067070	16-03-95
		GB-A,B 2241706	11-09-91
		KR-B- 9409862	18-10-94
		KR-B- 9409863	18-10-94
US-A-5453121	26-09-95	AU-A- 7063494	24-01-95
		WO-A- 9501404	12-01-95
		EP-A- 0714422	05-06-96
US-A-4585484	29-04-86	JP-C- 1579875	13-09-90
		JP-B- 2005784	05-02-90
		JP-A- 59174663	03-10-84
		JP-C- 1579876	13-09-90
		JP-B- 2005785	05-02-90
		JP-A- 59174664	03-10-84
		JP-C- 1579877	13-09-90
		JP-B- 2005786	05-02-90
		JP-A- 59174665	03-10-84
		DE-A- 3410855	27-09-84
		GB-A,B 2140020	21-11-84
WO-A-9214795	03-09-92	HK-A- 70291	06-09-91
		AU-A- 1230192	15-09-92
		EP-A- 0571451	01-12-93
		JP-T- 6507305	25-08-94
US-A-5453122	26-09-95		
		AU-A- 1240092	15-09-92
		EP-A- 0571453	01-12-93
		WO-A- 9214794	03-09-92
		JP-T- 6507651	01-09-94
		US-A- 5466287	14-11-95

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 96/00229

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5397387	14-03-95	AU-A- 2111695 WO-A- 9527758	30-10-95 19-10-95
WO-A-9602598	01-02-96	AU-A- 2917195	16-02-96
EP-A-348181	27-12-89	JP-A- 2004523 DE-D- 68917809 DE-T- 68917809 US-A- 5500662	09-01-90 06-10-94 19-01-95 19-03-96

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.